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Clinical and radiological outcome of distal tibia fracture treated by locking compression plating using minimally invasive percutaneous plate osteosynthesis technique

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Abstract

Introduction: The study was conducted to assess for clinical and radiological outcome particularly complications and healing rate of distal tibia fractures treated by locking compression plate using minimally invasive percutaneous plate osteosynthesis technique. It preserves soft tissue with limited operative exposure.

Objectives: Assess the clinical and radiological outcome of distal tibia fractures treated by locking compression plating using minimally invasive percutaneous plating. To evaluate the healing rate, radiological outcome and complications in these cases.

Methodology: Study was conducted in all patients with distal tibia fractures admitted to our Al-Ameen medical college hospital, Vijayapur from November 2015 to November 2017. Twenty patients with mean age of 38 years was taken into the study. Patients were followed up at regular intervals. Clinical and radiological outcome were evaluated at the end of one year.

Results: There were fourteen males and six female patients enrolled in the study. Fracture united in all twenty patients. All were extra articular fractures which were classified based on Arbeitsgemeinschaft für Osteosynthesefragen (AO) classification. Seven patients had associated fibula fracture. Mean duration for fracture union was 18.8 weeks. Post operatively three patients had ankle stiffness, three had occasional pain and two patients developed superficial wound infection. Based on modified ankle score of Olerud and Molander, we got excellent results in five cases, good in eight, fair in five and poor in two cases.

Conclusion: Locking compression plating using minimally invasive percutaneous plate osteosynthesis technique is a good treatment option for fractures of distal tibia. Accurate positioning and proper fixation of the plate with minimal dissection are essential to produce good clinical and radiological outcome. We strongly recommend this procedure for all extra articular distal tibia fractures.

Keywords: Distal tibia fracture, locking compression plate (LCP), minimally invasive percutaneous plate Osteosynthesis (MIPPO)

1. Introduction

Surgical treatment of fractures has evolved significantly since the development of open reduction and internal fixation concept by AO group in twentieth century. To achieve endosteal healing by good anatomical reduction and rigid fixation entails dissection of fracture site and surrounding soft tissues. This is more like a double edged sword as it brings with it complications like infections and devitalization of fracture fragments. To circumvent this problem, biological methods of fracture fixation has evolved in last few decades where priority is to lessen the extensive soft tissue stripping, preserving vascularity of fracture fragments and fracture haematoma. Intramedullary nailing ticks all the marks prerequisite for biological fixation. However, it technically fails as preferred treatment for periarticular fracture of distal tibia. Distal tibia fractures constituting 7 percent of all tibia fractures often present a challenge to orthopaedic surgeon^[1]. Three dimensional configuration of this area is designed to increase area of articular surface and reduce stress on ankle joint. Fractures at this area are usually the result of high energy axial compression and rotation forces. Soft tissue management is equally important alongside the bone reconstruction done.

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Locking compression plates (LCP) provide good results in comparison to conventional plates in management of distal tibia fractures [2, 3, 4]. Preservation of fracture haematoma, minimal soft tissue stripping and percutaneous plating may favour good results by minimally invasive percutaneous plate osteosynthesis (MIPPO) technique [5, 6].

2. Materials and Methods

All patients aged eighteen or more suffering from extra articular distal tibia closed fractures admitted in a tertiary care centre were enrolled in the study. This was a prospective study done from November 2015 to November 2017. Pathological fractures, intra articular fractures, fractures in non-weight bearing limb, open fractures and fractures in children were excluded. AO classification was used to classify the fractures. Informed written consent was obtained from all patients for surgical procedure and for participation in the study was taken. Institutional ethics committee clearance was taken for conducting the study.

3. Results

In this study, twenty cases of distal tibia fracture in adults treated by LCP using MIPPO technique. Age of patients ranged from 22 years to 52 years average being 38.2 years. Fourteen were male and six were female patients. Eleven had fracture of left tibia and nine had fracture of right tibia. All fractures were closed fractures. Road traffic accidents was the cause of fracture in twelve, fall from height in seven and one was due to a direct injury. Road traffic accidents was the dominant cause in male patients (ten patients) and fall from height in female patients (four patients). Length of follow up was a mean of 14.3 months with range of 12-18 months. Seven had associated fibula fracture, five of which were fixed by one third semi tubular plate. Mean operative time was 64.5 minutes with a range of 35 minutes to 120 minutes. Average union time was 18.8 weeks. Time for full weight bearing ranged from eight weeks to twenty-five weeks. Post-operative complications were seen in eight patients. Three had occasional pain, three had ankle stiffness and two had superficial wound infection. Based on Olerud and Molander ankle score [7], we got excellent results in five cases, good in eight, fair in five and poor in two patients.

4. Discussion

Distal tibia fractures at the junction of diaphysis and metaphysis are one of the challenging orthopaedic injuries to manage. Extensive soft tissue damage, comminution of the fracture because of the subcutaneous nature of bone and high velocity trauma associated with them all have implications on long term outcome of these fractures [8]. An array of treatment options is available which have been studied and compared since many years [9, 10]. Options for treatment include external fixation, intramedullary nailing and plate fixation [11, 12]. External fixators when used as definitive treatment are associated with high rate of malunion (5-25%), non-union (2-17%), loss of reduction, loosening and pin tract infection (10-100%) which makes it a less preferred technique [13, 14]. However, it is superior to other modalities when there is an open fracture associated with excessive soft tissue stripping [15]. Intramedullary fixation with nails has advantage of closed stabilization with no damage to overlying soft tissue at the fracture site and preservation of fracture haematoma. However, widening of medullary canal in metaphyseal area during nail placement is associated with poor angular and rotational stability [16]. Inadequate reduction, intra operative

loss of reduction after nail insertion, fat embolus syndrome, anterior knee pain, implant failure and malunion are reported complications [16]. Nailing is a better treatment option for treating distal tibia fractures with at least three centimetre distal fragment and no articular incongruity [17]. Open reduction and internal fixation has shown increased rates of infection and malunion. MIPPO technique drastically reduces these complications as it causes minimal iatrogenic soft tissue stripping, preservation of fracture haematoma and vascularity of fracture fragments resulting in good outcome [14]. AO distal tibia locking plates are pre contoured to the anatomy of distal tibia and thus allows placement of plate without disruption of fracture fragments. Distal part of plate allows for locking screws that provide stability where adequate bone purchase is difficult. Threaded holes lock to the locking screw head minimising plate bone interface and maintains vascularity at the fracture site. Proximal holes allow locking or cortical screws where relative or absolute stability can be achieved. Anatomical reduction of fracture should be done under image intensifier before fixation. Fibula fractures if present will affect fracture reduction. We preferred fibula fracture fixation using one third semi tubular plate before tibia for better alignment especially when syndesmosis was found to be involved. Distal tibia fractures are associated with gross swelling, skin injury and blisters. Skin condition determines the timing of surgery. All surgeries done in our study was only after the swelling subsided and wrinkle sign was seen. As it is a rigid fixation, post-operative plaster immobilization was not necessary. Ankle stiffness was seen in only three cases due to comminuted fracture and delayed weight bearing. Partial weight bearing was allowed six weeks post operatively and full weight bearing by 12 weeks when radiological callus was visible in at least three cortices and not associated with pain. Identification of great saphenous vein and great saphenous nerve and adequate drill sleeve placement helped us in having not a single case with iatrogenic neurovascular injury. Occasional pain due to impingement of hardware on the skin, ankle stiffness and superficial wound infection which completely healed with antibiotics were the few complications seen in our study. No patients came with skin necrosis in follow up. All patients returned to their routine work in six months. Comparing results of our study with other treatment modalities, our results are comparable to other studies using LCP by MIPPO technique.

5. Conclusion

Adequate stabilization of distal tibia fractures can be obtained by LCP using MIPPO technique, particularly useful in extra articular fractures and in osteoporotic fractures where it mitigates problem of late collapse, malalignment and screw cut out since stability of construct does not solely depend on the quality of bones. It helps achieve good anatomical reduction even in difficult situations like comminuted fractures. Good union rate due to preservation of vascularity and minimal iatrogenic soft tissue compromise. To conclude, it is a simple yet straight forward procedure and understanding the basic principles of fixation and indications for use of LCP by MIPPO technique is a must before it is used.

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